Date: March 22, 1973

To: ERTS Contracting Officer
Code 245, GSFC
Greenbelt, Maryland 20771

ERTS Technical Officer
Code 430, GSFC
Greenbelt, Maryland 20771

ERTS Project Scientist
Code 650, GSFC
Greenbelt, Maryland 20771

ERTS Scientific Monitor
Code 650, GSFC
Greenbelt, Maryland 20771

NASA Scientific and Technical
Information Facility
Attn: ERTS Resources
P. O. Box 33
College Park, Maryland 20740

From: James V. Drew, Principal Investigator (UN-062)
412 Administration Building
University of Nebraska
Lincoln, Nebraska 68508

Re: Progress Report (Type I)

The following progress report summarizes work accomplished from January 1, 1973 to February 28, 1973 according to Article II, Item 3 of the contract schedule included in contract NAS5-21756.

a. Proposal to evaluate the use of ERTS-A imagery in mapping and managing soil range resources in the Sand Hills Region of Nebraska (MMC #020).

b. GSFC Identification Number of Principal Investigator: UN-062.

c. The Spectral Data Projector/Viewer ordered during the fall of 1972 arrived in early January, 1973. Problems associated with accurate registration of multiband imagery utilizing this instrument have not been solved as yet.

d. Initial attempts at generation of color composites from 70 mm imagery have been only partially satisfactory. Evaluation of the color composite generated from MSS bands 4, 5 and 7 of image 1061-16552 show vegetation patterns and geographic features in a manner similar to aerial color infrared photography. Resolution to determine relatively small range sites is difficult due to registration problems. At this time it would appear that the minimum size of discernible range sites, assuming a nearly square shape, would be apprcximately 200 acres.

Comparisons of vegetative patterns on the color composite with an overlay delineating soil mapping units prepared for evaluation of high altitude color infrared photography show much the same relationship of vegetation pattern to soils delineations as demonstrated by the high altitude color infrared photography. Preciseness of fit will have to be determined on better quality color composites generated from early season imagery obtained during May and June, 1973. Delineation of Aquic Haplustolls and Typic Haplaquolls from associated subgroups appears to be straight forward. Further division of these two subgroups into subirrigated and wetland range sites appears promising.

Further evaluation of color composites will be carried out to determine if Typic Ustipsamments can be readily separated from Entic and Typic Haplustolls. Since this operation depends primarily on small differences in image density, visual examination does not indicate an obvious and immediate separation.

Range site delineations follow the pattern of associated soil mapping units. Subirrigated sites, due to their high near-infrared reflectance, are shown in red on color composites. Sands sites, which appeared mottled blue gray and white on the aerial color infrared photography, appear lighter in the density of their yellowish-green color than sandy sites. The range of density represented by these two sites will determine how successful their separation will be. Differences in density can be seen between specific sands and sandy sites being studied and between sandy sites of differing biomass production.

Reflectance differences among the various lakes of the Sandhills also appear on the color composites. Data concerning water quality collected previously by state agencies have been compared with reflectance from the lakes. There does not appear to be a correlation between available water quality data and reflectance noted in the different wavelength bands.

Diazochrome color composites will also be examined to determine their value in evaluation of the imagery. Since this process is essentially a contact print made using a different color for each wavelength, problems of registration may be minimized. Composites generated by this process can then be photographed and/or enlarged for range site delineation and comparison of soil mapping units and vegetation patterns.

Ground truth will continue to be collected on range sites selected in the summer of 1972 and found to be suitable on the basis of evaluation of ERTS imagery obtained during the fall of 1972. Vegetation identification will be feasible only when sufficient plant growth has occurred. Forage density measurements in

the form of clipping and capacitance meter readings will be taken on suitable sites within three days of satellite overpass as soon as vegetative growth warrants measurement. Cooperation with Texas A & M for their Great Plains Corridor study will be an integral part of ground truth collection.

e. Significant Results: Color composites generated from bands 4, 5 and 7 of MSS image 1061-16552 show that Aquic Haplustolls and Typic Haplaquolls can be separated from other subgroups present on Sandhills rangeland. Since Aquic Haplustolls are suitable for establishment of center pivot irrigation systems, this provides one means of locating and assessing sites for the establishment of center pivot irrigation for irrigated pasture or other irrigated crops. This separation also provides for a rapid assessment of subirrigated land, much of which is used for harvest of hay. Subsequent estimates of hay production can then be made as ground truth establishes actual production levels.

f. The following manuscript has been accepted for publication by the Journal of Range Management.

Seevers, P.M., P.N. Jensen and J.V. Drew. 1973. Satellite imagery for assessing range fire damage in the Sand Hills of Nebraska. J. Range. Mgt.

A paper was prepared and presented at the ERTS-1 Symposium March 5, 1973 entitled:

Evaluation of ERTS-1 imagery in mapping and managing soil and range resources in the Sand Hills region of Nebraska. Paper was presented by Dr. Paul M. Seevers.

g. Recommendations: No recommendations are offered at this time.

h. Changes in standing order forms: No changes in standing order forms have been requested during the period of this report.

i. ERTS image descriptor forms: Attached are image descriptor forms which list imagery received during the period of this report.

j. Data Request forms for retrospective data: No data request forms for retrospective data have been submitted.

k. Other information: No additional information is available at this time.

cc: Dr. David Lewis
Dr. Paul Seevers

March 22, 1973

Article II, Item 3e; Significant Results:

Discipline 1. Agriculture/Forestry/Range Resources

Subdiscipline C. Range Survey and Classification

e. Significant results:

Color composites generated from bands 4, 5 and 7 of MSS image 1061-16552 show that Aquic Haplustolls and Typic Haplaquolls can be separated from other soil subgroups present on Sandhills rangeland. Since Aquic Haplustolls are suitable for establishment of center pivot irrigation systems, this provides one means of locating and assessing sites for the establishment of center pivot irrigation systems for irrigated pasture or other irrigated crops. This separation also provides for a rapid assessment of subirrigated acres, much of which is used for harvest of hay. Subsequent estimates of hay production based on image density can then be made as ground truth establishes actual production levels.

ERTS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

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ID _____

DATE February 28, 1973

PRINCIPAL INVESTIGATOR Dr. J. V. Drew

GSFC UN-062

ORGANIZATION University of Nebraska

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Cropland	Dunes	Lakes	
1165-16332-M	x			
1165-16330-M	x			
1170-17011-M				Rangeland
1170-17020-M		x		
1170-17022-M	x			
1169-16552-M			x	
1190-17140-M	x			
1190-17134-M	x			
1190-17131-M	x			
1201-16332-M	x			
1201-16334-M	x			
1201-16341-M	x			
1202-16395-M	x			
1187-16565-M				Clouds
1184-16391-M	x			
1184-16393-M	x			
1186-16504-M		x		

*FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE PRODUCT ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Cropland	Dunes	Lakes	
1186-16510-M	x			
1185-16452-M	x			
1188-17014-M				Clouds
1185-16443-M	x			
1185-16445-M	x			
1171-17065-M				Rangeland
1171-17072-M				"
1171-17074-M	x			
1166-16382-M	x			
1166-16384-M	x			
1166-16391-M	x			
1166-16393-M	x			
1186-16501-M	x			
1172-17123-M				Rangeland
1172-17130-M				"
1172-17132-M	x			
1172-17135-M	x			

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Cropland	Dunes	Lakes	
1165-16335-M	x			
1152-17021-M		x		
1152-17024-M	x			
1149-16444-M				Clouds
1149-16450-M				"
1135-17072-M				Rangeland
1135-17074-M				"
1136-17130-M				"
1173-17182-M				"
1148-16395-M	x			
1189-17073-M		x		
1189-17082-4	x			
" " -5	x			
" " -6	x			
1189-17075-4	x			
1189-17075-5	x			
1189-17075-7	x			
1202-16390-M	x			

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Cropland	Dunes	Lakes	
1202-16393-M	x			
1187-16560-M	x			
1187-16562-M		x		
1130-16395-M	x			
1133-16555-M			x	
1133-16561-M	x			
1132-16500-M			x	
1132-16503-M			x	
1132-16505-M	x			
1132-16512-M	x			
1136-17132-M				Rangeland
1136-17135-M				"
1136-17141-M				"
1153-17082-M	x			
1150-16511-M	x			
1147-16340-M	x			
1148-16383-M	x			
1167-16440-M			x	

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ORGANIZATION University of Nebraska

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Cropland	Dunes	Lakes	
1167-16442-M	x			
1167-16445-M	x			
1167-16451-M	x			
1152-17015-M		x		

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